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THE EFFECT OF SALT WATER ON RICE.

By

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College Station, Brazos County, Texas.

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The Effect of Salt Water on Rice.

By G. S. FRAPS.

At some of the rice farms located near the coast, the amount of water pumped is sometimes greater than the capacity of the stream to supply and as a result salt water finds its way up the stream and is pumped upon the fields. This is more liable to occur in dry than in moist seasons. Salt water is known to have a very injurious effect upon rice. The object of these experiments was to ascertain, if possible, what amount of salt water is dangerous.

DANGER DEPENDS ON CONDITIONS.

The danger from salt water depends upon the degree of saltness, the length of time it goes on the land, the stage of growth of the plant, the amount of rainfall, the permeability of the soils, and perhaps other conditions. The water pumped upon the fields is diluted by that already present so that water containing comparatively large quantities of salt may be pumped for a short time and do little damage except near the point of inflow. A water containing a small percentage of salt may cause injury when pumped for some time, on account of the accumulation of the salt.

EXPERIMENTAL WORK.

The following experiments were carried out in pots eight inches in diameter and eight inches high. The concentration of salt referred to is that of the water within and on the soil. The capacity of soil and pot for water were known.

SERIES 1.

Planted May 17, irrigated May 27, when second leaf had appeared and plant was about four inches high. Salt was added only in the first irrigation.

Irrigated With	Results
Pot 34—Distilled Water	did well
Pot 35—0.05 per cent salt	did well
Pot 36—0.3 per cent salt—Grew well at first, died at tops of leaves June 3, died afterwards.	
Pot 33—1.0 per cent salt	Dried up May 31, died June 1.

Conclusions. One per cent sodium chloride kills rice very quickly. Three tenths per cent may kill it, but slowly, and 0.05 per cent apparently does not effect it.

SERIES 2.

Salt water added in the first irrigation two weeks after plants were up, rice six inches high.

Pot 60—Water alone ..... 8.2 gm. grain produced
64—0.05 per cent salt .....9.4 gm. grain produced
63—0.10 per cent salt .....6.6 gm. grain produced
62—0.15 per cent salt .....7.9 gm. grain produced
61—0.3 per cent salt .....7.2 gm. grain produced

In this experiment, 0.3 per cent salt used after the plants were two weeks old was not injurious.

SERIES 3.

Salt water was added when the rice was about two feet high and six weeks old. The salt water was added at intervals of a week until the solution in the pot was the concentration stated.

Pot 68—No salt .....9.8 gm. grain
65—0.3 per cent salt .....2.3 gm. grain mostly chaff
66—0.5 per cent salt .....0.5 gm. grain all chaff
67—1.0 per cent salt ..... Died three weeks after application of salt

HOW MUCH SALT IS DANGEROUS.

From these experiments it appears that salt water containing 0.3 per cent salt or over is dangerous to the crop. That is to say, if sufficient salt water is pumped to make the concentration of the water upon and in the soil greater than 3 parts of salt in 1000, there is likely to be damage to the crop. Water containing this quantity of salt may perhaps be allowed to flow upon the fields for a short time, because it will be diluted by the water already present, but if used long, salt may accumulate and cause damage. Indeed, even weaker salt solutions, used continuously, may cause damage.

We would advise that no salt water containing over 0.5 per cent salt be used. Rice farmers must be at all times cautious in the use of any salt water at all.

HOW TO DETECT SALT.

Salt water may be detected in three ways—by taste, by urinometer, and by nitrate of silver.

(a) By Taste. Water containing 0.2 per cent salt has a faint salt taste. The salt taste increases with the amount of salt. At one per cent the water has a distinct saline taste. This method, however, cannot be considered as a good test.

(b) By Urinometer. This is a simple method, but unfortunately it is influenced by the temperature of the water. It involves the use of a delicate instrument known as the urinometer. It consists of a glass bulb with a graduated stem, and a cylinder. The water is placed in the cylinder, the urinometer placed in the water, and the reading taken. If 60 degrees F,

the instrument sinks to the zero mark (see figure) the water is pure. If it goes only to two spaces below zero (Specific gravity 1.002) the water may be characterized as dangerous. If it goes to four spaces below zero (1.004 sp. gr.) the water must be considered as highly dangerous and we advise that it be not used. The urinometer is a very delicate instrument and care should be exercised in using it. Both it and the cylinder should be kept clean and free from dirt. The water used should be clear. If necessary, the water should be allowed to settle before making the test.

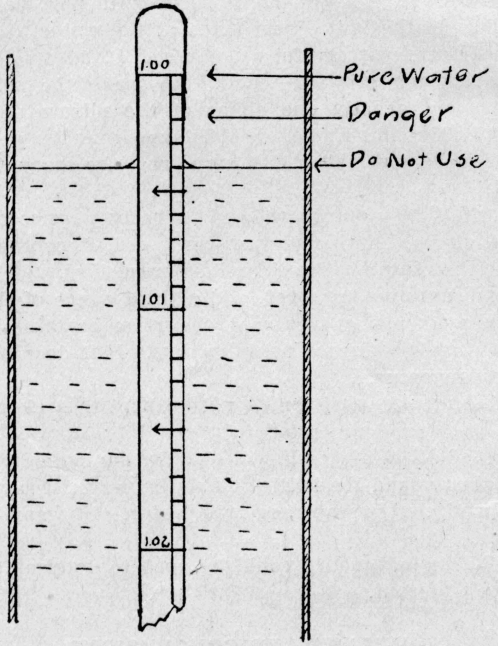

Fig. I.

This instrument can be purchased from Eimer and Amend, 205 Third Ave., New York; from Henry Heil, St. Louis, Mo., and it may also be possible to order it through local druggists. Order a "Standard urinometer, reading 1.000 to 1.020" with cylinder.

Caution. The reading of the urinometer depends upon the temperature. It is graduated to read at 60 degrees F., and at higher temperatures the results are not satisfactory. If, for example, the water has a temperature of 88 degrees F., the instrument will sink below the zero mark, nearly two spaces. Water containing enough salt to be considered as dangerous may at 88 degrees F., give nearly the reading of pure water at 60 degrees F., we would therefore advise, that when a sample of water is to be tested with the urinometer, that the water be placed in a room by the side of a sample of water, such as rain water, known to be pure, or very nearly so, and allowed to remain long enough for both samples of water to attain the same temperature. Then make the reading upon the known water, and then upon the water to be tested.

(c) The Silver Nitrate Method. The following method will probably prove the most satisfactory. To carry it out, one needs a small graduate, an eight ounce bottle of clear glass, a cork, and two solutions.

(1) Silver Nitrate. Dissolve 130.6 grains crystalized nitrate of silver in 32 ounces distilled water or dissolve 8.5 grams in 1000 cc. water.

(2) Potassium Chromate. Dissolve 19 grains in 4 ounces distilled water or 1 gm. in 100 grams water.

A glass graduate, which will measure one ounce.

These supplies can be obtained from any druggist.

Method. Rinse out an eight ounce bottle with pure rain water, or cistern water. Put into the bottle one ounce of the water to be tested. The water should be clear, and carefully measured. Add five or six drops of the chromate of potash solution—enough to make the solution decidedly yellow. Measure out exactly one ounce of the nitrate of silver solution, pour it into the bottle, and shake. If the liquid remains yellow, it contains more than 0.15 per cent of salt. If it turns red, the amount of salt present is negligible.

If the solution does not turn red, add a second ounce of the nitrate of silver to it, and shake. If the mixture turns red, it contains between 0.15 and 0.3 per cent salt, and may be classed as suspicious.

If the mixture does not turn red, add a third ounce of the silver nitrate solution and shake. If it now turns red, the water contains between 0.3 and 0.45 per cent salt, and is classed as dangerous. If it does not turn red, the water is highly dangerous.

Caution. The nitrate of silver should be kept in a glass stoppered bottle, wrapped in paper and protected from the light. If any gets on the hands it should be washed off at once. It will blacken the hands and spot clothing. The measuring glasses and the bottle should be perfectly clean. They should be rinced with good cistern water, or rain water. No soap should be used in cleaning them.

The method described above could be used to determine approximately the amount of salt present.

SUMMARY AND CONCLUSIONS.

(1) Water containing 0.3 per cent salt or over is dangerous to rice. Water containing less may be dangerous.

(2) Water containing 0.5 per cent salt or over should not be used.

(3) Water may be tested by taste, by a urinometer, or by silver nitrate. A method is outlined. The last named method will probably be most satisfactory.